

Vol. 41

Friday, 15 February 1963

No. 4

TABLE OF CONTENTS

MEDICAL DIGESTS

Effect of Cold Water Immersion on Burn Edema in Rabbits	3
Use of Hydrostatic Pressure on Burn Injury in Rabbits	4
Reaction to Extreme Stress - Impending Death by Execution...	5
Structure and Composition of Rat Reticulocytes	10
Hepatitis Morbidity in the U.S. 1961 - 1962	12

RADIATION MEDICINE

Diagnosis of Injury Resulting from Occupational Exposure to Ionizing Radiation	13
--	----

MISCELLANY

Transport of Tetanus Toxin Across the Rabbit Placenta and Fetal Membranes	17
Automation in Pharmacy Service - USNH Jacksonville	17
Off-Duty Injuries	18
Heart "Failure" of Sharks	19
Naval Aviation Museum at Pensacola	19
Air Pollution and Disease	19

FROM THE NOTE BOOK

Meeting of American College of Physicians	20
Editor and Executive Director Named for Military Surgeons ..	20
Reservist Physical Examinations BuMed Notice 6120	21
Problems of Leukaemia	21

DENTAL SECTION

Foreign Bodies in Air and Food Passages	22
Enamel Demineralization Inhibited by Fluoride Treatments	23
Bacteremia after Oral Surgery...	24
Professional Notes	24

AVIATION MEDICINE

Electroencephalographic Changes During Blackout Produced by Positive Acceleration	27
---	----

RESERVE SECTION

Promotion Policy for Officers ...	38
Policy Changes on Transfer of Reserve Officers to or from Inactive Status	40

MEDICAL NEWS LETTER

Vol. 41

Friday, 15 February 1963

No. 4

Rear Admiral Edward C. Kenney MC USN

Surgeon General

Rear Admiral A.S. Chrisman MC USN

Deputy Surgeon General

Captain M. W. Arnold MC USN (Ret), Editor

Contributing Editors

Radiation Medicine

CDR J. H. Schulte MC USN

Aviation Medicine

Captain A. P. Rush MC USN

Dental Section

Captain W. R. Stanmeyer DC USN

Occupational Medicine

CDR N. E. Rosenwinkel MC USN

Preventive Medicine

CDR J. W. Millar MC USN

Reserve Section

Captain K. W. Schenck MC USNR

Submarine Medicine

Captain G. J. Duffner MC USN

Policy

The U. S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

* * * * *

Change of Address

Please forward changes of address for the News Letter to: Commanding Officer, U.S. Naval Medical School, National Naval Medical Center, Bethesda 14, Md., giving full name, rank, corps, and old and new addresses.

* * * * *

The issuance of this publication approved by the Secretary of the Navy on 28 June 1961.

Effect of Cold Water Immersion
on Burn Edema in Rabbits *

A.G. Shulman MD, and K. Wagner MD, Los Angeles, Calif. Surg
Gynec Obstet 115: 557-560, November 1962.

Cold water immersion and application have been used successfully for the local treatment of lesser burns in human beings for several years. It has been well established that burn pain is relieved by this treatment. Those who have used this method carefully have also been impressed with the more rapid healing of the burn sites and lowered incidence of infection. Objective measurements of these observations have not yet been statistically established because of the recognized difficulty in comparing results of treatment of burns in human beings.

However, there is one beneficial effect of the cold water treatment which can be measured. Blocker, Ofeigsson, and Shulman have all noted the lessening of edema formation when this treatment is used as initial therapy, and some have also noted the reduction of edema which has already been established before the onset of treatment. In the experimental animal, Courtice in 1946 made this same observation. Clinically, in humans, it has been found that water at temperatures of 10 to 15 degrees C usually is the most comfortable and beneficial. The work done by Courtice was with water of 0 degree C, a temperature which is uncomfortably cold for humans, extremely difficult to maintain, and may actually be harmful if used over prolonged periods of time. For these reasons, a controlled study was undertaken in rabbits to test the effect of water at 10 to 15 degrees C on the edema which occurs after a standard scald. Scald burns were selected for this study because Fox and Lasker have indicated that the edema is more extensive following scald burns than following flame burns.

In earlier investigations, edema in lesser burns has been observed to be reduced by cold water immersion; the studies described herein demonstrate that this fact is also true of extensive burns of animal extremities. What has been proved in the animal has been observed in the human on numerous occasions. Since it is impossible to standardize extensive limb burns in human beings, exact measurements with controls have not been possible.

As in the experimental animals, it has been the writers' clinical observation that optimum results in severe and extensive burns have been obtained when cold water immersion of the burn area, either continuous or intermittent, is maintained for the entire period of the expected edema formation, i. e., up to 48 hours after burn. During this period heating devices have been applied to the nonburned surfaces wherever possible to maintain body temperature above 90 degrees F or 34 degrees C. Thus, generalized hypothermia is deliberately avoided. In extensive circumferential burns of the extremities, distal ischemia may develop. In order to prevent this complication, Kaplan

* From the Department of Surgery, Cedars of Lebanon Hospital, Los Angeles.

and White have recommended prophylactic decompression by longitudinal incisions. Such procedures may be extremely hazardous. Cold water immersion can achieve the desired effect without the risk. As a prophylactic method, the degree of edema can be limited. In already established edema, prolonged immersion can help reduce swelling.

Thus far, two benefits have been clearly established by the use of cold water as therapy for burns, namely, the relief of pain and the reduction of edema. Although clinical observations of lessened incidence of infection and faster and better healing have been made, controlled studies in animals have not yet been completed but are being undertaken.

However, the relief of pain and the reduction of edema together should warrant the further use of this method of local treatment of burns.

* * * * *

The Effect of Hydrostatic Pressure
on the Burn Injury in Rabbits *

John J. Wolfe MD, F.A.C.S., Jerre L. Noland Ph D, and Harold S.
Cavanah MS, Louisville, Ky. Surg Gynec Obstet 115: 621-625,
November 1962.

The authors' experiments clearly demonstrate that the application of 10 inches of hydrostatic pressure by saline solution to the burned backs of rabbits markedly reduces burn edema formation. The absolute water content of pressure-treated burns was less than half that of untreated burns. It is of interest that the relative water content of the treated burns was also decreased. A possible explanation for the latter phenomenon is that plasma from the peripheral circulation in its passage through burned tissue becomes depleted of some protein which remains behind to enrich the edema fluid. Another possibility is the failure of damaged regional lymphatics to return plasma protein back to the general circulation. The application of pressure would seem to serve the purpose of reducing the total edema fluid accumulation by two-thirds. This decrease may be expected to have a significantly beneficial effect upon prevention of circulatory collapse in clinical cases of extensive burns.

Leach and associates, calculating from data on guinea pigs, estimated that a 50% body burn would result in loss of 57% of total plasma volume. Their calculations were based upon a 100% increase in tissue weight due to burning; with the greater tissue weight increase seen in the writers' studies, an even greater change in plasma volume would be predicted. There is every reason to expect that in human burns similar control of otherwise lethal fluid leakage

* From the Department of Surgery, University of Louisville School of Medicine and the Medical Research Laboratory, Veterans Hospital, Louisville. Supported in part by U.S. Public Health Service grant CY-4567.

should occur if the individual could be promptly immersed in 10 inches of saline. It should be emphasized that, in the authors' experiments, pressure was always applied within 15 minutes of the burn. Alternate burns were treated. After 4 hours, the burned tissue was excised, dried, and the water content determined. It is expected that some interchange of fluid will take place via the burn; hence, the importance of using a physiologic solution such as Ringer's. Burned tissue without pressure treatment increased 119% in weight, but pressure treatment limited the edema accumulation to a 43% gain in weight. Pressure treatment also caused a decrease in water content of the edema fluid. Experiments on the interchange of water across the burn are now in progress. If significant interchange occurs, then water and electrolyte balance may be achieved to some extent without having to resort to intravenous fluids.

Infection is today the leading cause of death in patients with severe burns. Starting as a surface phenomenon, the infection soon invades dead tissue since the latter forms an ideal pabulum for bacterial growth and propagation. Antibiotics appear to have had little, if any, effect on the mortality rate in patients with severe burns. Indeed, antibiotics have been blamed for the enhancement in virulence of *Pseudomonas*.

Immediate submersion of the burned area in a sterile physiologic solution which is constantly recirculated, filtered, and resterilized should act as an effective and potent preventive measure against infection.

The authors have designed a unit—now in operation—for the clinical management of severe burns. It consists of a deep tub equipped with a pump, filter, heater, thermostat, and an electronic water sterilizer. The saline solution is recirculated and sterilized at a rate of 500 gallons per hour. The plan is to immerse the burned areas of the patient in 10 inches of Ringer's solution as soon as possible with the expectation that the benefits already mentioned will ensue. Application of this principle to the clinical treatment of severe burns is believed to be feasible. NOTE: (Why not combine the therapeutic principles laid down in this and the preceding article ?)—Editor

* * * * *

Reaction to Extreme Stress - Impending
Death by Execution*

Harvey Bluestone MD, and Carl L. McGahee MD, New York City.
Amer J Psychiat 119: 393-396, November 1962.

We conventionally think of death as "the worst thing" that can happen to us. Knowing—as we all do—that we will die in some vague future does not impose any great stress. The man in the grip of a relentlessly fatal disease has to cope with much more severe stress. But, mercifully, his death date is not fixed and he can always hope to see tomorrow's sun rise. Presumably, the greatest of stresses would be imposed on the man who knows he is going to be put to death—and knows just when that will be.

The authors have studied eighteen men and one woman in the Sing Sing death house. Because of the inmate utilizing opportunities for appeals for clemency or commutation there is adequate time for repeated psychiatric interviews and psychologic examinations.

These men are housed in an area detached from the rest of the prison. They have few visitors, although the authorities impose no restrictions on visiting. One might expect them to show severe depression and devastating anxiety, yet neither symptom was conspicuous among these nineteen doomed persons. By what mechanisms did they avoid these expected reactions to such overwhelming stress? Do their emotional patterns change during a year or two in a death cell? And, do these defenses function to the moment of execution—or do they crumble toward the end?

The nineteen histories had certain features in common. All had come from deprived backgrounds. All but one came from homes where the father was missing (deserted, dead, unknown, or separated) during the childhood or adolescence. Practically all had been brought up (during their growing years) in institutions or foster homes. Not one had an education better than that of tenth grade. Some were illiterate. Their intelligence varied from an IQ of 60 to one with an IQ of 140. All had been convicted of murder. None of the murders was long planned: they were impulsive. Many were committed in connection with a felony. The world appeared as a hostile, dangerous, and menacing place, and they had reacted in their way—by aggression, suspiciousness, and cynicism. Following are brief summaries of the reaction of some of these men to their imprisonment in the death house.

Case Studies

1. This man has the longest residence in the death house of those in this study—approximately 2 years. An overt confirmed homosexual, he maintained a calm conviction that he would ultimately be pardoned. This belief remained bolstered throughout by an unchanging contention that he had been framed by the legal and medical authorities involved in his prosecution. Psychological testing showed a man of average intelligence with considerable withdrawal from real emotional interaction with others. Defense mechanisms of denial and projection were effective in warding off anxiety and depression despite prolonged incarceration in the death house.
2. This inmate is the only woman in this series. She is of dull intelligence, acts in a playful and flirtatious manner. She was usually euphoric, but became transiently depressed when she thought her case was going badly. She frequently complained of insomnia and restlessness. These symptoms quickly disappeared when she was visited by a psychiatrist whom she enjoyed seeing and talking to in a self-justifying and self-pitying manner. Psychological tests showed pervasive feelings of insecurity, repressive defenses, and an inability to handle angry and aggressive feelings in an effectual manner.

3. This inmate is a withdrawn, sullen uncommunicative individual. When visited in the death house he would elaborately and slowly wash his clothes ignoring examiners. He spends much of his time reading profound philosophical works which are beyond his comprehension. His intelligence is dull-normal. He has become progressively more suspicious and grandiose during his death house stay.
4. This man gives a long history of delinquent behavior. He is a litigious minded individual who states that he can appeal his case for years. He is obsessed with his own power and is convinced that a lawsuit against the district attorney for lost automobile tools kept that official from being reelected. He has become progressively more angry and abusive, ultimately necessitating his physical isolation from other inmates. His IQ is 134. Projective tests show a chronically cold, withdrawn, narcissistically invested personality. Withdrawal, projection, and denial are prominent defense mechanisms.
5. This man is at all times euphoric. He has shown little anxiety during the full year he has spent in the death house. He has led a hedonistic life and has never been able to make future plans. His inability to see beyond the day seems quite effective in enabling him to avoid anxiety and depression.
6. This inmate showed during his early months of incarceration a contemptuous indifference toward the authorities and his own plight. Gradually, however, depression appeared and became progressively more intense. This was rather dramatically reversed when the inmate presented an apparent religious conversion which seemed to both occupy his mind and also elevate him above the authorities and his situation. However, this defense was only partially successful for this individual who had a life-long history of discharging all tensions by immediate impulsive acting-out. Psychological testing showed dull-normal intelligence and a primitive, self-absorbed, hostility ridden personality.
7. This inmate related to examiners in an open and direct manner. He is mentally dull and preoccupied with thoughts of voodoo spells. His primary

TABLE 1

1. Age range of death house prisoners	
18 or younger	1
19 or 20	2
21 through 25	5
26 through 30	3
30 to 35	5
over 35	3
2. Family background	
Parents together during most of childhood	1
Father unknown or deserted	7
Father divorced or separated	10
Father and mother unknown	1
3. Highest school grade reached	
Fourth or lower	4
Fifth or sixth	8
Seventh or eighth	2
Ninth or tenth	5
4. Intelligence Quotient	
60 through 69	2
70 through 79	5
80 through 89	7
90 through 119	4
120 through 140	1
5. Family status of prisoner as adult	
Never married, but had common-law spouse	5
Never married, no regular consortium	11
Married but separated	2
Living with wife	1
6. Psychological defense mechanisms used	
(Totals more than 19; some used more than one)	
Denial by isolation of affect	7
Denial by minimizing the predicament	4
Denial by delusion formation	1
Denial by living only in the present	4
Projection	7
Obsessive rumination in connection with appeals ..	3
Obsessive preoccupation with religion	2
Obsessive preoccupation with intellectual or philosophical matters	5

defense mechanism is denial of the possibility of being executed. This works poorly and he is chronically anxious and periodically depressed. His anger at his accomplice, who he is convinced is the cause of his difficulties, seems to relieve him of some of his unpleasant feelings. He amuses himself in working on a taunting poem which he proposes to recite when his accomplice is executed. This mechanism, too, is ineffectual and he reverts from these thoughts of revenge to a contemplation of his own plight.

8. This man is a moody individual who feels he is the victim of a Jewish plot since the judge, district attorney, and his own court appointed lawyer are Jewish. He denied his guilt repeatedly during his early days in the death house, but became progressively more confused and a few days before his scheduled execution asked the examiner for truth serum so that he would know whether or not he committed the crime. He showed alternating use of introjection and projection. He would become depressed when news of his appeal was bad, and when a stay of execution was granted he became paranoid and grandiose. He managed in some obscure way to identify his impending death with that of Lumumba who had recently been killed in the Congo and felt that his own execution would make him a martyr in the cause of anti-imperialism.
9. This man stands out in the series as being the one who most successfully employed intellectualization as a means of defending against anxiety and depression. He elaborated a philosophy of life and values in which his own criminal career became not only justifiable, but respectable. He rationalized his crimes by emphasizing the hypocrisy and perfidy of society on the one hand and comparing himself with policemen and soldiers and others who live honorably "by the gun" on the other. This system was so effective for him that even when execution appeared imminent, he maintained his hero's martyr role and disdained to request executive clemency.
10. This inmate is an illiterate, inadequate individual who was convicted as an accomplice to a robbery-murder. He had an over-all IQ of 51. He showed primarily depression, withdrawal, and obsessive rumination over the details of his crime and conviction. He eventually evolved a poorly elaborated paranoid system whereby he supposedly was betrayed and framed by his girl friend and one of the codefendants. Despite the looseness of his persecutory thinking, it was accompanied by a clear-cut elevation in his mood and reduction of anxiety.
11. This inmate, also an accomplice to a robbery-murder, showed one of the most florid pictures of any in this series. Both grandiose and persecutory themes were prominent, but the latter predominated. He maintained that his arrest and conviction were malicious frauds, and he meticulously and obsessively combed through the court record to substantiate his contentions. His arguments were labored and illogical, hinging on such points as the use of words like "who" and "whom." The paranoid mechanisms seemed to mitigate, but not completely defend him, against depression.

12. This is one of the two inmates in this series who uses religious preoccupation as his major defense mechanism. He repeatedly in an almost word for word way stated his situation as follows: "No one can understand how I feel unless it happened to you. Christ came to me and I know He died for my sins. It doesn't matter if I am electrocuted or not. I am going to another world after this and I am prepared for it." As his stay progresses, he becomes increasingly more hostile and antagonistic, and his behavior progressively out of keeping with his professed religious ideas. In addition to obsessive rumination, projection and withdrawal are employed to ward off feelings of anxiety and depression.

Discussion

Faced with certain and ignominious death, a person would presumably be overwhelmed with anxiety or plunge into the depths of depression. Yet this does not happen. What defense does the human mind set up against intense anxiety or a paralyzing depression? The authors suggest, on the basis of the nineteen case studies, that the defenses are mainly of three types—denial, projection, and obsessive rumination. The commonest form of denial is isolation of affect. "So, they'll kill me; and that's that"—this, said with a shrug of the shoulders, suggests that the affect appropriate to the thought has somehow been isolated. A second common form of denial is to minimize the gravity of the present situation and to take for granted that an appeal will be successful. The third and most extreme manifestation of denial, used by only one individual, was to delusionally believe that a pardon had been granted. Denial is also commonly used by persons dying of disease.

Another phenomenon deserves further explanation since it may easily be confused with denial. Several cases impressed the examiners as being so immersed in the present moment as to virtually be insulated from any significant emotional relatedness with their own past or future. Thus, they do not have to deny anxiety because they do not experience it. This, incidentally, is the traditional profile of the "psychopath" who reacts only to present stimuli.

Projection is an obvious, and not uncommon, mechanism. Typically, it takes the form of persecutory delusions. At least three of the prisoners considered themselves persecuted by specific groups in the community. This mechanism converts dissolute criminals into martyrs. It is a comforting delusion. While it does not deny that death is just around the corner, it tries to lend it dignity and meaning. In some men there seems to be an almost quantitative reciprocal relationship between the use of projection and introjection so that they are either overly paranoid or depressed.

A third way of coping with painful affects is to think furiously about something else. Thus, the depressing thought is elbowed out of consciousness by the crowd of other ideas. This is seen in a morbid obsessional concern about the preparing of appeals or pleas for clemency. One prisoner spoke to the authors for an hour about whether a pronoun in the appeal transcript should be "who" or "whom." To be sure, a meticulous concern with the appeal brief

is rational; in these cases, however, the concern is obsessional, ruminative, and ineffective. Another type of obsession (two men showed this) is preoccupation with religion to the exclusion of everything else. The prisoners who developed this syndrome also had involved their confederates in death sentences, although neither accomplice had killed anyone. Presumably, this religious conversion served to blunt guilt feelings about involving the accomplices. This activity served two other purposes: it distracted them from anxiety, and it offered a route to a happy life in the hereafter. The third type of obsessive rumination is the intellectual: a dipping into philosophical thought by a man whose life had hitherto been devoted to hedonistic pursuits.

Some try desperately to mould a respectable image of themselves. This is certainly one sluiceway for draining out anxiety—as illustrated, for example, in the way in which one prisoner identified himself with Lumumba and the recent world shaking events in the Congo.

The group support these men receive from fellow inmates is variable. Some are quite appealing and receive considerable emotional and even material support in terms of cigarettes and help with correspondence. Others manage quickly to antagonize their fellows and are in turn ridiculed and tormented by them in a direct and sadistic manner. This is often true when a man gets the reputation of being a malingerer. The inmates are quite antagonistic to anyone they feel is falsifying religious beliefs or feigning mental symptoms.

Conclusion

Traditional ego defense mechanisms alleviate distress. They also mitigate anxiety and depression which would otherwise overwhelm the prisoner in a death cell. Some psychiatrists allege that the death fear (whether on the battlefield or in the death house) serves as an irrational surrogate for some other fear—such as castration. This over-simplified explanation does scant justice to the inescapable certainty shared by all but anticipated only by man.

* Read at the 118th annual meeting of The American Psychiatric Association, Toronto, Canada, May 7 - 11, 1962.

* * * * *

Structure and Composition of Rat Reticulocytes

I. The Ultrastructure of Reticulocytes

T. Hallinan, E. Eden, and R. North, Department of Biochemistry and Electron Microscope Unit, University of Sydney, Sydney, Australia.
Blood XX: 547-556, November 1962.

Electron micrographs of sectioned mammalian red blood cells show that while erythroblasts and earlier forms possess many of the characteristic cytoplasmic structures found in other mammalian cells, erythrocytes lack any demonstrable intracellular structures whatsoever. Reticulocytes arise by enucleation

from erythroblasts and are the immediate precursors of erythrocytes. It is of interest, therefore, to compare their ultrastructure with that of these cells. To date, it has not been possible to obtain an over-all picture of the ultrastructure of reticulocytes because of difficulties in embedding and sectioning and lack of contrast caused by the high electron scattering power of their hemoglobin. However it has been possible to discern mitochondria and vesicles in them,

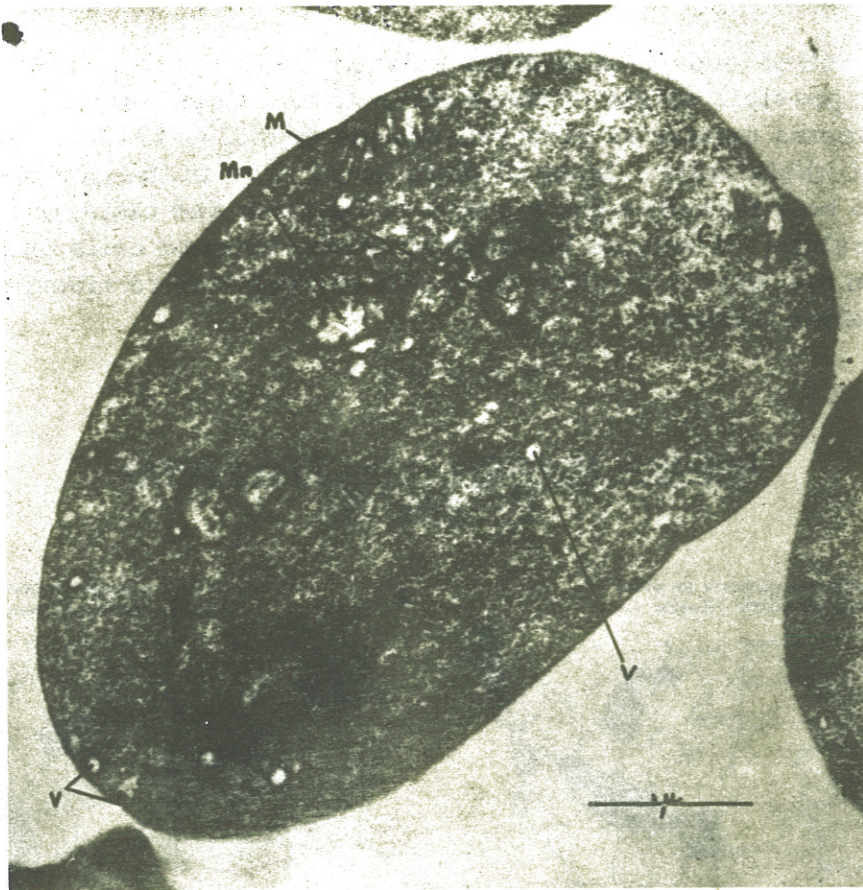


Fig. 1.—Section of a reticulocyte embedded in araldite showing an intact mitochondrion (M); altered mitochondria (Ma), with disorientated cristae and in one case a ruptured outer membrane; rounded vesicles (V), one of which is sectioned very close to the limiting margin of the cell; small cisternae (Cis). Electron opaque ribosomes are distributed throughout the dense ground substance.

and structures interpreted as elongated, endoplasmic-reticulum cisternae have been reported, although in no case could the fine details of these organelles be distinguished. Preliminary experiments showed that improved preservation and visualization of the ultrastructure of reticulocytes could be obtained by substituting araldite for methacrylate, the embedding medium used in previous studies. The appearance of sections of fixed cells embedded in araldite is described in this communication. (Figure 1 is an example.) Morphologic examination has been supplemented by the isolation and characterization of the diameter 10-20 m μ , electron-opaque granules from reticulocytes which have been identified as ribosomes.

Summary

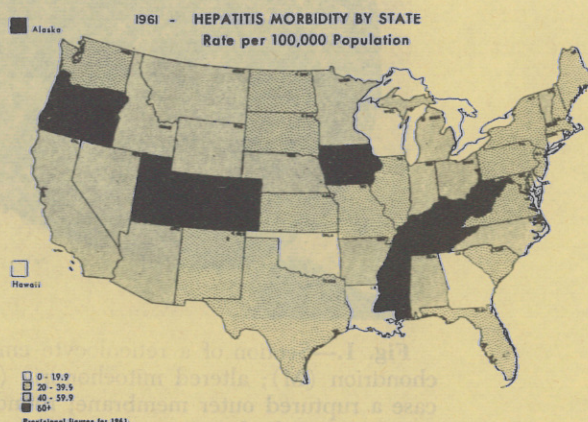
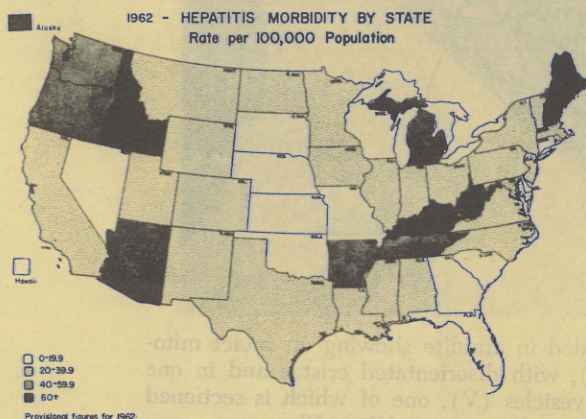
Fixed sectioned rat reticulocytes, embedded in araldite, have a regular outer limiting margin like that of erythrocytes; however, unlike erythrocytes, they contain cytoplasmic organelles similar to those in erythroblasts and other mammalian cells. These include mitochondria, ribosomes and a sparse endoplasmic reticulum consisting of rounded vesicles and occasional small cisternae. The endoplasmic reticulum appears to consist wholly of "rough surfaced" elements.

Many mitochondria have disorientated cristae or ruptured outer membranes. The possible origin of these alterations is discussed.

Ribosomes appear as electron-opaque granules 10-20 mμ in diameter in sections of whole cells. Most of them occur free in the cytoplasm while a few appear to be attached to the surface of vesicles and cisternae of the endoplasmic reticulum. They can be isolated from ruptured cells by high speed centrifugation and have a similar chemical composition to ribosomes from other mammalian tissues.

* * * * *

Hepatitis Morbidity in the United States 1961 and 1962



A preliminary total of 53,255 reported viral hepatitis cases throughout the U.S. in 1962 represents a 27% drop from the 72,733 reported in 1961.

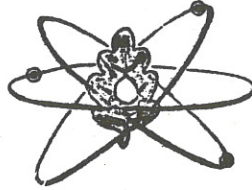
The hepatitis attack rates by State for 1962 and 1961 are shown in the maps. Significant increases in attack rates in 1962 occurred in Maine and Idaho. Both of these States reported a record number of viral hepatitis cases in 1962.

The geographic pattern of viral hepatitis throughout the U. S. in 1962 remained similar to the 1961 pattern, with a general decrease in the country.

From Morbidity and Mortality Report, PHS, Dept of HEW, Communicable Disease Center, Atlanta, Ga., 18 January 1963.

* * * * *

RADIATION



MEDICINE

ORIGINAL ARTICLE

THE DIAGNOSIS OF INJURY RESULTING FROM OCCUPATIONAL
EXPOSURE TO IONIZING RADIATION*

CDR John H. Schulte, MC, USN
Director, Special Weapons Defense Division

According to a recent newspaper article in the Washington Star there are 518 nuclear reactors either operational or under construction throughout the world. The United States Navy owns and operates almost one-fifth of them. The Navy also operates and maintains many types of radar and other microwave generators which are capable of producing ionizing radiation. Naval shipyards use a large number of radiation sources for shipboard radiography. In addition, naval hospitals and research laboratories use a large variety of radioisotopes, radioactive sources and radiation generating equipment for diagnosis, therapeutics and medical research. It is obvious, therefore, that the Naval Medical Officer needs to know how to differentiate the harmful effects produced by occupational exposures to ionizing radiation from the effects produced by other diseases or illnesses.

Much has been learned about the effects of ionizing radiation from many observations on man and extensive experiments with laboratory animals. In fact, the effects of ionizing radiation have been studied more thoroughly than the effects of many other environmental health hazards. The results of exposure of all or most of the body to a large rapidly administered dose of penetrating radiation is well-documented by a large volume of generally non-controversial literature.

Although less is known about the effect of small doses of ionizing radiation, current information is sufficiently comprehensive to provide a basis for the diagnosis of occupational radiation injuries. The difficulties encountered in diagnosis and compensation for occupational injuries resulting from exposure to ionizing radiation are similar to those encountered in other types of occupational injuries.

*Adapted From: Occupational Exposure to Ionizing Radiation, Joint Comm. Report approved by the Council on Occ. Hlth of the AMA. ArchEnvirHlth 5:626-30, 1962

General Considerations in Diagnosis

1. In addition to occupational exposures to ionizing radiation, military personnel and civilian employees are constantly exposed to natural radiation and to some radiation from radioactive fall-out. They may also receive significant exposures from medical or dental diagnostic and therapeutic procedures. Miscellaneous other sources may also contribute to their total radiation exposure.
2. The diseases, injuries and delayed conditions which may be induced by exposure to radiation can also result from other causes.
3. There may be a long latent period between the time of exposure and the onset of symptoms.
4. Many radiation effects occur only when definite threshold exposure levels are exceeded.
5. The relationship of effects to dose may vary with age, sex, race, and constitutional differences.

a. The effects of exposure to external radiation sources will also vary with: (1) dose rate, (2) absorbed dose, (3) time distribution of dose—continuous or intermittent, (4) total lifetime dose, (5) extent of exposure—whole body or partial, (6) type and energy of radiation, (7) radiosensitivity of tissue or system exposed, (8) biological effectiveness of the radiation for the tissue considered, and (9) nature of effect being considered.

b. The effects of an internally deposited radioactive material will further vary with: (1) site of deposition in organs and tissues, (2) physical half life of the radionuclide, (3) biological half life of the radionuclide, (4) type and energy of the emitted radiations, (5) radiosensitivity of the depot organ or tissue, and (6) essentiality of the affected organs.

Detailed information regarding radiation effects may be obtained from handbooks of the National Committee on Radiation Protection and Measurements published by the National Bureau of Standards, Department of Commerce, Washington, D. C.

More Specific Considerations in Diagnosis

1. Physiological Changes. Transient physiological, biochemical and histological changes may be caused by exposure to ionizing radiation. These changes include shifts in the mitotic index in various tissues, changes in the differential and total white blood cell counts, an increase in the number of bilobed or binucleated lymphocytes and an increase of desoxyribonucleic acid in lymphocytes. These changes may also occur as the result of other diseases or illnesses. Furthermore, it cannot be concluded that these changes are evidence of harmful effects per se. At best, they provide supportive evidence that exposure to ionizing radiation has occurred.
2. Tissue Repair. Repair processes greatly influence the possibility of establishing a diagnosis of radiation injury. The threshold dose must be exceeded before an observable biological effect occurs. Furthermore, the observable biological effects may disappear with time.
3. Genetic Damage. Genetic damage roughly proportional to dose has been demonstrated in fruit flies (*Drosophila*) with rapidly administered radiation doses in the range of 25 to 50 rem. Extrapolation from fruit flies to man and from doses of 25 rem of rapidly administered radiation to doses of 0.1 rem received during a forty-hour week introduces errors of considerable magnitude.

Even though mutations may be induced in an individual, identifiable damage in a traceable offspring may never occur. If damage does occur, it may be delayed for many generations. If we assume that human genes have the same response to radiation exposure as do the genes of mice, it would require between 40 rem administered rapidly as a single dose and 240 rem administered over a prolonged period to double the present mutation rate in man; and if we assume, further, that doubling the mutation rate will produce one affected child per thousand births in the next generation, individuals receiving an acute dose of 400 rem would receive $400/40$ or 10 times as much genetic injury as the calculated dose required to double the mutation rate. The probability of genetic damage appearing in the immediate offspring would be .01 if both parents had received this radiation dose. The probability of genetic damage would be .005 when only one parent has received this dose of radiation. If the 400 rem is accumulated slowly over a lifetime, the probability of genetic damage is further reduced by a factor of about 6 or approximately 1 change in 1200 ($p < .001$). When an abnormality, considered to be of genetic origin, appears in the immediate offspring of an individual who has absorbed a dose of radiation from occupational and other exposure, the above formulation may be used to estimate the statistical probability that the abnormality resulted from the occupational exposure.

4. Life Shortening. Laboratory animals exposed to large, rapidly administered, sublethal doses of radiation demonstrate life shortening which is roughly proportional to the dose. If man reacts similarly to laboratory animals, an acute whole body dose of radiation in excess of 200 rem might produce some life shortening. This could only be detected on a statistical basis in a large group and not in individual cases. Since many factors are involved in the determination of the life span of an individual, the contribution of a sublethal dose of radiation to life shortening is extremely difficult to determine. Excessive smoking, improper dietary habits and obesity probably have a greater effect on shortening the life span than an acute whole body dose of 200 rem.

The life span of animals who have received less than 10 rem per week is not significantly different from that of control animals who have received no radiation. Furthermore, radiologists exposed to less than 100 rem per year for periods up to 20 years do not show a statistically significant life shortening. It seems reasonable, therefore, to conclude that chronic occupational exposures many times greater than the maximum permissible dose of 5 rem per year will probably not produce measurable life shortening.

5. Leukemia. The incidence of leukemia in radiologists, Hiroshima and Nagasaki survivors, and children irradiated in utero indicate that radiation at high dose rates does increase the occurrence of leukemia in exposed groups. A statistically significant increase in the incidence of leukemia has been demonstrated among radiologists exposed to doses of radiation in excess of 100 rem per year. The existence of a threshold dose which must be exceeded to produce leukemia is very uncertain. Evaluation of the possible role of occupational exposure at or below the maximum permissible exposure rates in the causation of leukemia requires further study before accurate conclusions can be made; but it seems extremely unlikely that an exposure of 5 rem per year or less will increase the likelihood of producing leukemia in an individual.

6. Other Malignant Disease. Since the early days of X-ray, cancer of the skin has been known to result from exposure to radiation. Experience has shown an increase in the incidence of sarcomata among radium dial painters and pitchblend (radium ore) miners due to the deposition of radium in the bones. However, the amount of radiation received by individuals during the early

research in X-ray and the radium absorbed by dial painters and pitchblend miners was far in excess of the present maximum allowable for radiation workers.

7. Cataracts. The minimum dose of X-ray necessary to produce cataracts has been determined during exposures of the lens while treating malignant diseases of the eye with measured doses of radiation. The smallest dose of X-ray causing cataracts in humans is about 200 rem. Much larger doses have been given without producing cataracts, however.

Establishing a Diagnosis

1. History. To make a diagnosis of radiation injury resulting from occupational exposure, it is first necessary to establish an occupational exposure to radiation. Naval directives require all military activities using radioactive materials or radiation generating equipment to have a personnel dosimetry program. The purpose of this program is to measure and record the radiation dose received by military and civilian personnel who are exposed to radiation while in the performance of their duties. An accurate history of radiation exposure can then be obtained from the permanent records maintained on each of these individuals.

2. Physical Examinations. Careful preplacement physical examinations should be performed on all personnel prior to their assignment to duties involving exposure to radiation. This will help eliminate personnel suffering from, or predisposed to, diseases or illnesses similar to diseases or illnesses which may develop as a result of excessive exposure to ionizing radiation.

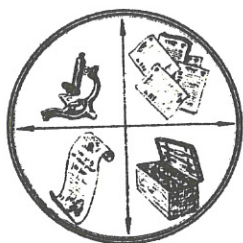
Periodic followup examinations on all personnel assigned to duties involving exposure to radiation will provide the earliest evidence of physiological or biological changes produced by exposure to radiation. Specialists with additional experience in radiation may be needed to perform the follow-up examinations; for example, specially trained ophthalmologists may be able to elicit early lenticular changes produced by radiation. They may also be able to differentiate between radiation-induced cataracts and those due to other causes, from the appearance and sequence of changes in the lens.

3. Bioassays. Radiochemical analyses of body secretions, excretions, and tissue biopsies, radon breath samples, and total body radiation counts can provide positive evidence of the existence of an internal body burden of radioactive material.

4. Causal Relationships. In addition to the commonly used clinical means, statistical methods are necessary to determine the probability of a causal relationship between occupational exposure to radiation and late effects such as the development of leukemia or other malignant disease.

Conclusion

While the diagnosis of occupational radiation illness or injury is not easy, it does not differ basically from a situation in which an industrial chemical is a suspect health hazard or carcinogen. The diagnosis of occupational radiation illness or injury is based on a positive history of occupational exposure to ionizing radiation, the presence of physical changes consistent with the effects which may be produced by exposure to ionizing radiation, and the statistical probability that a causal relationship exists between the occupational exposure and the positive physical findings.



MISCELLANY

Transport of Tetanus Toxin Across the Rabbit Placenta and Fetal Membranes

Alexander A. Fedinec PhD, Philadelphia, Penna. J Lab Clin Med
60:606-611, October 1962.

The passage of the exotoxin of *Clostridium tetani* through the placenta and fetal membranes was investigated in 42 pregnant rabbits. Of the toxin, 25 minimum lethal doses were injected at the following sites: gastrocnemius muscle of the mother, ear vein of the mother, fetal thorax, fetal amniotic cavity, and uterine lumen of the mother. The animals were observed for the development of tetanus symptoms, and sacrificed at various intervals for collection of samples of maternal blood, fetal blood, amniotic fluid, and fetal stomach contents to be assayed in mice for toxin. The results indicate that tetanus toxin cannot pass from the maternal to fetal circulation, nor from the fetal blood to the maternal blood. Toxin injected into the uterine lumen or amniotic cavity does not reach the maternal blood; however, it readily passes from these sites to the fetal circulation. The vitelline circulation of the yolk sac splanchnopleure is implicated as the route of tetanus toxin absorption into the fetal blood.

* * * * *

Automation in Pharmacy Service - USNH Jacksonville

At the annual meeting of the Florida Society of Hospital Pharmacists, held in conjunction with the Florida Hospital Association at the Dupont Plaza Hotel in Miami, 14 - 16 November 1962, papers were presented on Automation by LCDR T. W. Tober, Chief, Pharmacy Service, and LT N. L. Flower, Chief, Data Processing Division, U. S. Naval Hospital, Jacksonville.

The Brewer System, an automated vending machine for storage and issuance of drugs at the ward level, was presented by a local hospital pharmacist after which LCDR Tober spoke on automation as it might apply to pharmacy. The Naval Hospital formulary, narcotic control procedures, labels for prepackaged materials, and the requisitioning of supplies which are all done by the use of automated equipment at the hospital were presented. LT Flower gave an excellent presentation on the technical aspects of the above and also presented a billing procedure which might be used in civilian hospitals with access to data processing equipment. The program was arranged in coordination with the

Director of Professional Relations, School of Pharmacy, University of Florida, Gainesville.

The Pharmacy Service of USNH Jacksonville was host at the November 21st meeting of the Northeast Florida Pharmaceutical Association at the Staff Lounge of the Hospital. The social hour was followed by dinner with LCDR Robert Hux MC USN as guest speaker. Being a recovery surgeon for the astronaut flights, his topic was Orbital Flights. A film of the Scott Carpenter flight was shown.

* * * * *

Off-Duty Injuries

Office of Industrial Relations, OIR Newsletter, Vol's 13 and 14, No. 2, December 1962 and January 1963.

A study in which 95 activities are participating was started in April 1962 to discover the effect of off-duty injuries to the Navy's civilian employees. The civilian population of these activities represents 69% of the total Navy population. Reports have been submitted for a 2-week sample period in each of two calendar quarters. Results of the data have been extended to provide estimates for the entire Navy.

Ten times as many employees were injured off the job as on the job. The average time loss per case was 4 days. Sick leave was taken to cover 87% of time lost, annual leave was used for 5-1/2%. The remainder (7-1/2%) was absorbed by employees through leave without pay. During the sample period of the second study quarter, 50% more time was taken on leave without pay than during the first period. A corresponding reduction in hours was noted in sick leave. The significance of this is not clearly apparent and will be the subject of close analysis in subsequent reports.

It is estimated that off-duty injuries will cost the Navy and its employees over \$2,000,000 for one year. Of this amount, \$155,000 will come directly from the pockets of the employees since it represents leave without pay. Employees will also use about 606,000 hours of sick leave, thereby reducing their reserve against illness. Annual leave worth \$115,000 will be spent because of nursing injuries received in off-duty accidents; the time represented by this amount was intended for pleasurable rest and recreation.

In addition to these losses by employees, the Department of the Navy will also suffer because of having to pay out \$1,750,000 for accidents over which its activities had no control, and from loss of production for about 666,000 work hours.

Although the questionnaire used in the study does not require information on the source of off-duty injuries, a number of large activities submitted significant general information. From this, it appears that 60% of injuries from known sources were incurred around the home—home repairs, alterations and maintenance, power lawn mowers, or hobbies; 26% were due to motor vehicle accidents, and 14% were incurred during vacations and recreation.

Heart "Failure" of the Shark

Dr. Warren J. Wisby is an Office of Naval Research contractor who is studying animal behavior at the University of Miami's Marine Science Laboratory. He has made an interesting discovery concerning shark behavior. By means of implanted electrodes he has been able to record the electrocardiogram of sharks, and thus to determine the effect of fright and other stimuli on the fish. Instruments reveal that the heart of at least one fish—the lemon shark—stops beating on receiving an electric shock or any other of several "fright stimuli" tried, and that it recommences spontaneously a few minutes later. The lemon shark's heart stops beating, also, when chasing prey. This curious behavior—the cessation of heart action at precisely the time when tissue demands for oxygen and nutrients are greatest—is as yet not understood. Dr. Wisby expects to make further investigations. —John E. Flynn, ONR, New York. Naval

Research Reviews, December 1962

* * * * *

Naval Aviation Museum at Pensacola

A Naval Aviation Museum has been established by the Navy at Pensacola, Fla. It is located in existing facilities at the Pensacola Naval Air Station—naval aviation's first permanent home—and is under the military command of the Chief of Naval Air Basic Training (CNABATRA).

The mission of the Museum is to select, collect, preserve, and display appropriate memorabilia representative of the development, growth, and historic heritage of Naval aviation. The Museum will serve to promote the traditions of the naval service and naval aviation for Navy and Marine aviation cadets, aviation officer candidates, and junior officers undergoing flight training at Pensacola. It will also serve as an educational exhibit for the general public interested in aviation.

The Museum will be stocked from voluntary contributions of items from active and retired personnel throughout the Naval establishment. Naval Districts and Commands are currently being canvassed for assistance in locating appropriate items for the Museum. The Chief of Naval Air Basic Training has designated one officer and two enlisted men on a collateral duty basis to staff the Museum. A permanent curator will be provided by CNABATRA by reprogramming billets currently assigned to him. —NavNews, 15 January 1963

* * * * *

Air Pollution and Disease. It is clear that there is a close relationship between air pollution and disease, but its exact nature is unknown, and it is not yet possible to determine exactly which pollutants are responsible for causing or exacerbating specific illnesses. For epidemiologic studies in this field to be successful, greater agreement is needed on measurable indices of air pollutants and the diseases with which they are associated.—WHO Chronicle 16: 413-419, November 1962

* * * * *

FROM THE NOTE BOOK

Meeting of The American College of Physicians. Medical officers planning to attend the annual meeting of The American College of Physicians at the Denver-Hilton Hotel, Denver, Colo., 1 - 5 April 1963, are advised that the Armed Forces tri-service social hour will be held under Army auspices on the evening of Tuesday, 2 April, at the Officers Open Mess, Fitzsimons General Hospital in Denver. Further details will be available at or prior to the meeting. All military officers attending the annual session, their wives, and guests are invited to attend. The Navy Chiefs of Medical Service Dinner will follow the tri-service social hour.

Editor and Executive Director Named
for Military Surgeons

The Executive Council of the Association of Military Surgeons of the United States announced in December the selection of Brigadier General Frank E. Wilson as Executive Director, and of Brigadier General Amos R. Koontz as Editor of Military Medicine. Both gentlemen are Doctors of Medicine; they started their new duties the first of the year.

General Wilson, an active Medical Reservist of the Army, and Commander of the 805th Hospital Center, was formerly Executive Vice President of the Joint Blood Council at Washington, D. C. He brings to the Association a distinguished career of medical administrative experience, including legislative representation for the American Medical Association. Formerly, a National Medical Director of the American Red Cross, and previously a combat veteran in the European Theatre during World War II, General Wilson will manage the affairs of the organization under the policy and guidance of the Council.

"We foresee a revitalization of the Military Surgeons' programs, conventions, and journal activities and interests with these able medical officers leading the way," said Rear Admiral Calvin B. Galloway MC USN, the newly elected President of the Association.

The Editor of Military Medicine, Dr. Amos R. Koontz of Baltimore, Md., is Past President of the Association and a nationally known surgeon who has distinguished himself also in medical literature, and in the Maryland National Guard from which he is now retired. He will serve as Editor with a highly talented Editorial Board and will share his time with an active surgical and consultative practice in Baltimore. The new Editor is the author of over two hundred and ninety articles in surgical textbooks and journals. During World War II he commanded the Johns Hopkins Hospital Unit in the Pacific Theatre.

Military Medicine, a monthly magazine devoted to the interests and promotion of military medical science and the affairs of its members, is the official journal of the Association. Organized in 1891, the Association of Military Surgeons of the U. S. was incorporated by the Congress in 1903 and

became the first military or naval service association to receive a congressional charter. Distinguished medical officers of many Federal services have contributed their experiences fraternally through the Association's long and fruitful history. Notable examples of medical "guests" who have led the activities of the Association include Nicholas Senn, William Crawford Gorgas, Walter Reed, Edward Stitt, and Thomas Parran.

The organization's constituent services are the U.S. Army, Navy, Air Force, Public Health Service, Veterans Administration, Military Reserves, and National Guard. Representatives of these services with elected chairmen of the following sections constitute the Executive Council: Dental, Veterinary, Nursing, Medical Service Corps, Medical Specialists, Sustaining Members, Pharmacy, and Chapters. The Secretaries of the military services are among those designated as Ex-Officio members. The corporation, a nonprofit professional military medical association with approximately 6000 members, conducts an annual convention. With worldwide prestige, it drew ninety-two international delegates to its convention held in November 1962 in Washington, D. C.

BUMED NOTICE 6120

21 January 1963

Subj: Physical examinations of Naval and Marine Corps Reservists reporting for active duty including active duty for training of more than 30 days.

Ref: (a) MANMED art 15-82(5)

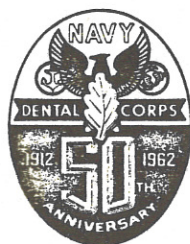
This BuMed Notice advises addressees of certain problems encountered in connection with the subject physical examinations and provides suggestions for corrective action.

Problems of Leukaemia. Human leukaemia presents many epidemiologic puzzles. Mortality is relatively high in the white population of the USA, but not in the non-white; in Denmark and in the Jewish population of Israel, but not in Finland, France, Ireland, Italy, or Japan. In the USA, the mortality is about 50% higher in towns than in the country, and the disease is more common in firstborn children of older mothers and in mongols. In England and Wales, mortality is higher in urban areas than in rural areas of the north, but the reverse is true of the south. —WHO Chronicle, November 1962.

An Apology. We regret that the credit line for the source of a recent digest article appearing in the Medical News Letter was omitted. "The Histotoxic Clostridial Infections in Man" by Dr. John D. MacLennan appeared originally in the journal, Bacteriological Reviews, Vol. 26, No. 2, Part II, pp 177-276, dated June 1962.

* * * * *

DENTAL



SECTION

Foreign Bodies in Air and Food Passages

Paul G. Bunker, Newberry Building, Aberdeen, S.D. The Role of Dentistry in Problems of Foreign Bodies in the Air and Food Passages. JADA 64:782-787, June 1962. Dental Abstracts 7(11):679-680, November 1962.

A high percentage of instances involving foreign bodies in the esophagus or tracheobronchial tree have dental aspects. Therefore, the cooperation of dentists is important in the prevention of these accidents.

About 30% of all foreign bodies in the air and food passages of persons of all ages are bones; in edentulous persons with complete dentures, this percentage rises to 85%. The tactile sense in the mouth diminishes with advancing age, and in patients with dentures the bone usually passes the point of recovery before the patient becomes aware of its presence. Warning these patients of this danger at the time the denture is fitted would prevent many of these accidents.

Dentures should be kept in good repair and properly fitted to insure good mastication. Patients with dentures should be instructed to chew their food twice as long as when they had their natural teeth.

It is wise to remove dentures before going to sleep. Dentures always should be removed prior to surgery as well as in instances of unconsciousness from other causes, including shock and intoxication.

Infants between 17 and 30 months of age are most likely to have foreign bodies in their air and food passages. At this age there is a strong tendency to put everything in the mouth. Infants do not expectorate inedible objects but try to swallow them instead, thus converting such objects into foreign bodies.

Nuts and raw vegetables or fruit should not be given to children less than 4 years old unless the foods are ground up, for the chewing habit is not firmly established until that age.

The South Dakota State Dental Association has prepared a pamphlet on the increased danger of foreign bodies in patients with dentures and in infants and younger children. The pamphlet can be inserted in the denture pamphlet of the American Dental Association, for distribution by the practicing dentist.

* * * * *

Inhibition of Enamel Demineralization
by Repeated Treatments With Fluoride Solutions

E. E. Fischer, Tufts University School of Dental Medicine, Boston, Mass.
Inhibition of Demineralization by Repeated Treatments With Sodium and Stannous Fluoride Solutions. J Dent Res 41:392-397, March-April 1962.
Dental Abstracts 7(11):687, November 1962.

An investigation was undertaken to determine (1) whether frequency of treatment of dental enamel with dilute concentrations of sodium fluoride or stannous fluoride, such as might be found in a dentifrice, would affect the subsurface demineralization rate of dental enamel, and (2) whether the age of the tooth is a factor in determining the effectiveness of topical application of fluoride in reducing acid demineralization.

Six freshly extracted, caries-free central incisors, collected from patients ranging in age from 20 to over 50 years, were cut incisogingivally into 6 sections. Each tooth section was imbedded between glass slides in an epoxy resin with the labial surface exposed by a slot to the surface. The 6 sections from each tooth were randomly arranged for treatment with equimolar solutions of sodium fluoride (0.027%) and stannous fluoride (0.05%) or with demineralized water, either once or twice a day. Each slide was immersed in 50 cc. of 0.5 M sodium lactate buffer of pH 5.0 and placed in an incubator at 37° c. For treatment, the slides were withdrawn from the lactate and rinsed in tap water, placed in the proper fluoride solution for from 3 to 5 minutes, rinsed and replaced in the buffer. Transparencies of each section were made at 72-hour intervals through a polarizing microscope. The distance of penetration in microns of the acid was determined by projecting the transparencies at a standard magnification of 250X and measuring the change with a millimeter rule.

Practically no difference in the rate of penetration was observed between sections treated once or twice daily with demineralized water. All the sections treated with a fluoride solution showed a slower rate of penetration and less total penetration than those treated with water, the rate of penetration in all instances being linear with respect to time.

Sections treated with sodium fluoride showed about the same rate of penetration, whether treated once or twice daily. Sections treated once a day with stannous fluoride solution had a rate of penetration very similar to those treated twice a day with sodium fluoride solution. Sections treated twice a day with stannous fluoride solution experienced the least amount of decalcification, amounting to 58% of reduction from the control in 264 hours.

The age of the tooth did not seem to be a factor in determining the effect of either fluoride solution on the rate of penetration or total penetration of the acid.

The results agree in part with those of Muhler and others (1948, 1953, 1958) at the University of Indiana, in which stannous fluoride was found superior to sodium fluoride in reducing the solubility of dental enamel in acids.

Bacteremia After Oral Surgery

Manuel Gutverg and Sol Haberman, Baylor University College of Dentistry, Dallas, Texas. Studies on Bacteremia Following Oral Surgery: Some Prophylactic Approaches to Bacteremia and the Results of Tissue Examination of Excised Gingiva. J Periodont 33:105-115, April 1962. Dental Abstracts 7(11):666, November 1962.

Various measures for the prevention of bacteremia produced by the trauma of gingival resection in 231 patients with periodontitis were compared. Before gingivectomy the patients were randomly divided into 4 groups on the basis of preoperative treatment, as follows: (1) a control group of 67 patients receiving no preoperative treatment; (2) 55 patients who received dental prophylaxis 5 to 7 days before gingivectomy; (3) 57 patients who received 250 mg. Mystecilin (a mixture of 250 mg. tetracycline and 250,000 units of mycostatin) every 6 hours starting 24 hours before surgery and continuing 24 hours postoperatively, and (4) 52 patients who received a dental prophylaxis 5 to 7 days before surgery and who also received the antibiotic treatment provided patients in group 3. To study the incidence of bacteremia during gingival resection, 231 blood samples were taken from 145 patients.

Of 67 patients in the control group, positive blood cultures appeared in 24 (35.82%). Of 55 patients who received only dental prophylaxis, positive blood cultures appeared in 21 (38.18%). Of 57 patients who received only antibiotic premedication, positive blood cultures appeared in 3 (5.26%). Of 52 patients who received both antibiotics and dental prophylaxis, positive blood cultures appeared in 5 (9.61%).

Tooth mobility, depth of periodontal pockets and use of a preoperative dental prophylaxis had little or no influence on the incidence of bacteremia. The use of antibiotics reduced considerably the incidence of bacteremia but did not prevent completely its occurrence.

Since the microorganisms recovered from the gingival surface and the periodontal pockets did not always correspond with those isolated from positive blood cultures, it is believed that the sources of the organisms responsible for bacteremia are not only the gingival surface and the periodontal pocket but the organisms that already have invaded the deep structures of the periodontal tissues.

* * * * *

Personnel and Professional Notes

Capt Nutting Appears at New Orleans Meeting. Capt Edwin B. Nutting DC USN on duty at the Marine Corps Recruit Depot, San Diego, Calif., presented a clinic entitled "Practical Clinical Endodontics" at the 15th Annual New Orleans Dental Conference. The conference was held 19-21 November 1962.

Dr. Fraleigh Lectures at Naval Dental School. Dr. Claud M. Fraleigh, Professor and Chairman, Department of Periodontics, School of Dentistry, West

Virginia University, Morgantown, West Virginia, lectured on "The 'Why' of Periodontics," to staff, resident, and postgraduate dental officers, and civilian and military guests, at the U. S. Naval Dental School, Bethesda, Md., on Wednesday, 19 December.

The program was televised from the National Naval Medical Center by closed circuit to other medical and dental activities in the local area.

Dr. Fraleigh is a retired Rear Admiral in the Naval Dental Corps. He is a Diplomate of the American Board of Periodontology and at present is serving on its Executive Council. Dr. Fraleigh is also a Fellow of the American College of Dentists.

Capt Kyes Appears at Detroit Meeting. On 20 November 1962 Capt Frank M. Kyes, DC, USN, Director, Dental Activities, Ninth Naval District presented a lecture on "Equilibration" at the Detroit Dental Society Meeting in Detroit, Michigan.

Maryland Western Shore Dental Society Meets at the U. S. Naval Academy. The Western Shore (Maryland) Dental Society recently held its monthly meeting in the newly modernized Dental Department. Officers of the department presented several different and interesting facets of Naval Dentistry. The various branches of dentistry were discussed with illustrated case presentations. Among subjects reviewed were: biopsy technique, partial denture construction, emergency office procedures, treatment of pulpless teeth, new instrumentation for gingival and bone disorders and extensive dental restorations with silver amalgam.

The professional part of the meeting followed a short business meeting conducted by Society President, Dr. Victor S. Leocha.

Capt K. L. Longeway DC USN is the Senior Dental Officer at the U. S. Naval Academy.

Cdr Counsell Appears in Scotland. Cdr Lee A. Counsell DC USN appeared at the Queen's Hotel Helensburgh, Dumbarton, Scotland, on 30 November 1962.

The Dumbarton Burns Club requested that Cdr Counsell speak on the subject "An American's Impressions of Scotland and the Scots" at its 1962 Saint Andrew's Night Dinner.

Cdr Counsell is the Senior Dental Officer assigned to the USS Proteus.

Capt Losee Participates in Symposia. Capt Fred L. Losee DC USN participated in the symposia on caries research and mechanisms of hard tissue destruction at the 129th American Association for the Advancement of Science meeting in Philadelphia, Pa. The meeting was held 28-30 December 1962.

Capt Losee is Dental Research Officer, Dental Department, Administrative Command, USNTC, Great Lakes, Illinois.

Capt Reilly Presents Lecture. Capt John V. Reilly DC USN was the principal speaker at a joint meeting of the Armed Forces Dental Society of Okinawa and

the Okinawan Dental Association held recently at the Fort Buckner Officers' Mess. His subject was a resume of pathologic conditions revealed by oral roentgenography. Capt Reilly is presently attached to the 3rd Dental Company, 3rd Marine Division (Rein), FMF.

LCdr Loren V. Hickey Presents Paper. LCdr Loren V. Hickey DC USN presented a paper entitled "The Rubber Dam an Investment in Dentistry" before the Cedar Rapids (Iowa) Dental Society at their meeting of 14 January 1963.

LCdr Hickey is on duty at the USNTC, Great Lakes, Illinois.

American Stomatological Society of Japan. The U. S. Naval Dental Clinic, Yokosuka, Japan hosted 73 members of the American Stomatological Society of Japan on 17 December 1962. Capt Donald E. Cooksey DC USN, Commanding Officer, U. S. Naval Dental Clinic, Yokosuka, Japan, presented a professional paper titled "Dental Problems Complicated by Involvement of the Maxillary Sinus."

The American Stomatological Society of Japan is made up of dental officers of the three Armed Services plus leading members of the Japanese Dental Association. The objective of this organization is to promote and exchange recent advances in dentistry.

Outstanding Research Paper in the Field of Oral Surgery. Cdr Philip J. Boyne DC USN, Chief of Dental Service, U. S. Naval Hospital, Key West, received special recognition for submitting an outstanding research paper in the field of oral surgery at the forty-fourth annual meeting of the American Society of Oral Surgeons. Cdr Boyne's paper was reviewed by representatives of the National Institutes of Health and several specialists in the health field.

Doctor Ward Lectures at NH San Diego. Dr. Terence G. Ward, C.B.E., recently presented a lecture on International Approach to Surgical Diagnosis and Therapy to staff, residents and postgraduate dental officers, civilian and military guests at the U. S. Naval Hospital, San Diego, Calif. Dr. Ward is Surgeon in Charge of the Department of Dentistry and Oral Surgery, Queen Victoria Hospital, East Grinstead, Sussex, England. He is also consultant to the Royal Navy, Air Force, and Army, President of the British Association of Oral Surgeons, Vice-Dean of the Faculty of Dental Surgery of the Royal College of Surgeons of England, and an Honorary Member of the American Society of Oral Surgeons. His lecture briefed the subjects of Radiographic Assessment and Removal of the Impacted Third Molar, Surgery in Relation to Prosthesis, Difficulties of Extractions, Treatment of Oral and Facial Trauma, Cysts of the Jaw, and Diagnosis of Facial Pain.

* * * * *

AVIATION MEDICINE DIVISION



Electroencephalographic Changes in Human Subjects During Blackout Produced by Positive Acceleration

R. D. Squires, R. E. Jensen, W. C. Sipple, and J. J. Gordon, Physiology Division, Aviation Medical Acceleration Laboratory, U. S. Naval Air Development Center, Johnsville, Pa.

The use of the electroencephalogram (EEG) as an index of the level of consciousness for human subjects undergoing severe environmental stresses such as would be experienced in high performance air or spacecraft and various flight simulators has attracted the attention of a number of investigators (1, 2, 3, 4, 5).

The correlation between levels of consciousness and/or alertness and EEG activity has been fairly well established by others - particularly with regard to levels of anesthesia, sleep, hypoxia, visual attention, etc. (6, 7, 8, 9, 10, 11). However, it still remains to be shown that a lowered level of consciousness in a subject, as reflected in his ability to perform a specific task, can be ascertained from real time EEG information. Equally important is the early prediction of impending loss of consciousness which depends on the detection of variations in the levels of consciousness and which are well above the threshold of complete loss of consciousness.

When continuous performance information is not available from a subject in a hazardous environment, which is most often the case since he must be free to perform other required tasks, it is felt that the EEG may furnish a useful index of his performance capabilities for medical monitoring purposes.

The Aviation Medical Acceleration Laboratory (AMAL) centrifuge provides a useful platform for varying the level of consciousness of human test subjects in an environment which is similar to actual flight conditions. It has the advantage over in-flight recordings in that experiments can be controlled and reproduced with a maximum of safety to the participants. Consequently, a study was undertaken on a series of subjects undergoing positive acceleration centrifuge runs at a level sufficient to lower head blood pressure to a point where visual gray and blackout conditions would occur. The purpose of the study was to evaluate the use of the EEG information on these subjects as an index of their level of consciousness, their depth of visual blackout and their performance capabilities under acceleration.

Methods

Each of 13 human subjects was subjected alternately to a set of peak accelerations of 6 and 7 G on two separate occasions. Peak G was attained in approximately 30 seconds after the initiation of a symmetrical, sinusoidal acceleration profile. The resultant inertial force vector was directed toward the feet, i. e., positive acceleration. Subjects consisted of six Navy pilots and seven experienced centrifuge subjects selected from laboratory personnel. One channel of EEG was recorded by placing two active electrodes, one on the right and one on the left side of the calvaria, approximately 2 cms. above and lateral to the occipital protuberance. The indifferent electrode was placed over the forehead in the midline. The description of the electrodes used and the method of restraint employed has been previously described (12). A standard Navy flight helmet was worn over the elastic electrode restraint.

The EEG signal was first amplified by a modified Litton* preamplifier carried in the breast pocket of the subject's flight suit before passing the signal through the centrifuge slip rings to an Offner type R dynagraph and a Precision Instrument type 207 tape recorder.

Additional instrumentation included was a bridge circuit attached to the EEG electrodes in order to detect resistance changes between the electrodes and the subject, permitting the evaluation of electrode movement as a possible source of artifact due to head movement during acceleration. The bridge was activated with a 50 KC source voltage. This frequency was then eliminated from the EEG signals by subsequent filtering.

The experimental procedure called for an eyes-closed period before and after each acceleration. The appearance of the alpha frequencies served as a check on the intactness of the system. The alpha frequencies also served to set the gain of the recorder amplifier to full scale deflection in terms of the amplitude of the eyes-closed alpha pattern for each subject. The system required approximately three seconds to obtain 95% of maximum deflection for a change in frequency amplitude.

Analysis of the taped EEG signals was accomplished by a 14-channel continuous frequency analyzer using band pass filters manufactured by Epsco**. The voltage output of each band pass filter was rectified and passed through a smoothing filter in order to obtain a direct current voltage proportional to the amplitude of the frequency band passed by each filter. The channels with their band widths as determined by calibration are given in Table I.

When the tapes were played back into the frequency analyzer the amplitude of the center frequency for each band pass filter was adjusted to this same magnitude of deflection for maximum eyes-closed alpha amplitude for

* Litton Industries, Electronic Equipment Division,
336 N. Foothill Rd., Beverly Hills, California

** Epsco, Worcester, Massachusetts

each subject by adjusting the gain of the recorder amplifiers. This method of scaling does not take into consideration the increase in band width of the higher frequency filters which could allow as much as 10 times the contribution from a uniform frequency distribution signal at the highest frequency.

CENTER FREQUENCY	2.5	4	5.5	7.5	8.5	9.5	10.5
50% down frequency	1.9 - 2.9	3.5 - 4.5	5.2 - 5.9	7.0 - 8.0	7.7 - 9.2	9.1 - 10.3	9.7 - 11.2
90% down frequency	1.6 - 5.0	3.0 - 5.5	4.5 - 6.2	5.5 - 8.5	7.0 - 10.5	8.0 - 11.5	8.7 - 12.0
CENTER FREQUENCY	11.5	13	16	19	23	28	36
50% down frequency	11.0 - 12.5	12.6 - 13.5	14.0 - 17.0	18.0 - 21.0	20.0 - 26.0	26.0 - 30.0	32.0 - 38.0
90% down frequency	10.3 - 13.5	10.5 - 15.0	12.5 - 20.0	15.0 - 25.0	16.0 - 29.0	22.0 - 34.0	24.0 - 48.0

"OFFICIAL PHOTOGRAPH U. S. NAVY"

Table I
Calibration of band pass filters

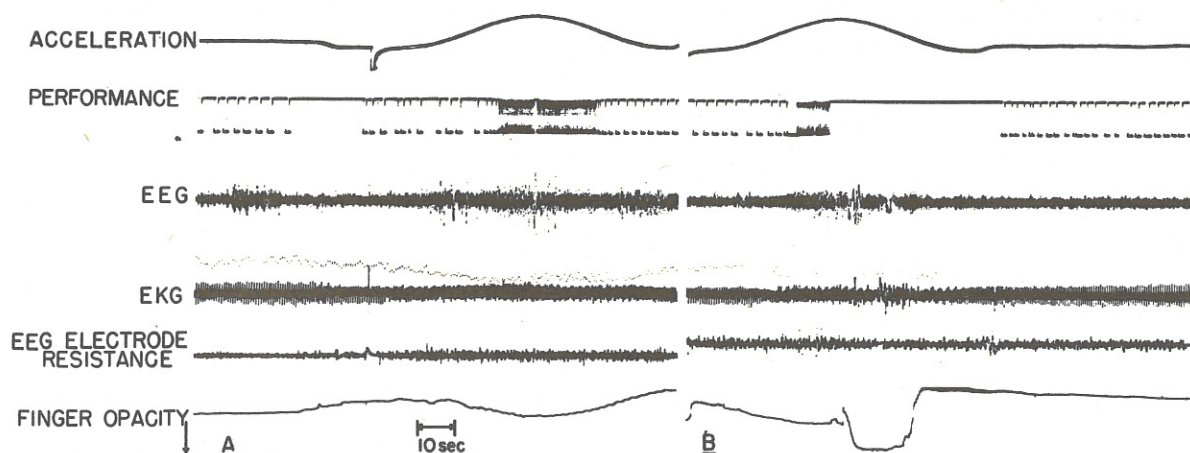
Results

Useful EEG records were obtained for more than 90% of the centrifuge runs. Good eyes-closed alpha patterns were obtained before and after accelerations. Freedom from large amplitude head motion artifact due to electrode displacement was shown by the absence of large fluctuations in the output of the bridge circuit (Figure 1). Large amplitude fluctuations from the bridge circuit, however, did result from forced, voluntary head movements prior to acceleration. In addition the signal levels during acceleration were less than or comparable in amplitude to the pre-acceleration eyes-closed alpha pattern, while signal fluctuations associated with forced, voluntary head motion were frequently greater. Most runs showed an increase in signal level sometime during acceleration. There were some that failed to do so and in the poor-performing groups the signal level fell to baseline levels during loss of consciousness at peak G. The contribution of the neck and jaw and jaw muscle potentials during acceleration to the high frequency analysis channels is difficult to evaluate or separate from increase in high frequency beta EEG activity; however, even if present it supports the conclusion of increased subject activation which decreases or disappears during decrease in the level or loss of consciousness (Figure 3, Subject R. Mc. II).

EEG Frequency Analysis

Analysis of a typical EEG pattern during acceleration is shown in Figure 2. This 14-channel analysis shows the characteristic changes observed during

"OFFICIAL PHOTOGRAPH U. S. NAVY"



Two Subject Runs at 6G Positive Acceleration on AMAL Human Centrifuge

Figure 1.

Figure 1A is a 6 G centrifuge run during which the subject experienced a 25-second period of visual blackout indicated by the period of rapid depression of the finger switch on the performance trace. Note the increase in amplitude of the unfiltered EEG without concomitant increase in change of electrode resistance indicative of electrode displacement.

Figure 1B is a 6 G centrifuge run during which the same subject experienced a 9-second period of visual blackout followed by unconsciousness indicated by the period of no switching immediately following blackout. Again note lack of evidence of change in electrode resistance. There is a marked fall in finger opacity at the onset of unconsciousness due to displacement of blood from the finger fixed at the level of the right atrium.

visual grayout and blackout conditions. The increase in high frequencies (16-36 cps.) shows the same general amplitude pattern as the acceleration profile. The lower range of beta frequencies (16-19 cps.) have a tendency to level out or to decrease during early blackout coincident with an increase in the lower frequency components. The alpha frequencies (8-13 cps.) often appeared during grayout and blackout but may disappear at very deep blackout when bursts of high amplitude low frequency components appear. The amplitude of alpha frequencies seen during visual blackout was much less than seen during eyes-closed before acceleration.

EEG During Blackout

For routine real-time monitoring and ease of presentation, three characteristic frequencies were chosen: delta, 5.5; alpha, 10.5; and beta, 29 cps. These frequencies are shown in Figure 3 for three runs showing visual grayout, blackout and unconsciousness. The mean changes in these three frequencies are shown in Figure 4 during the time course of acceleration along with the mean blackout characteristics of the three groups. The mean percentage amplitude change during the run as a whole on each of the frequency bands is

"OFFICIAL PHOTOGRAPH U. S. NAVY"

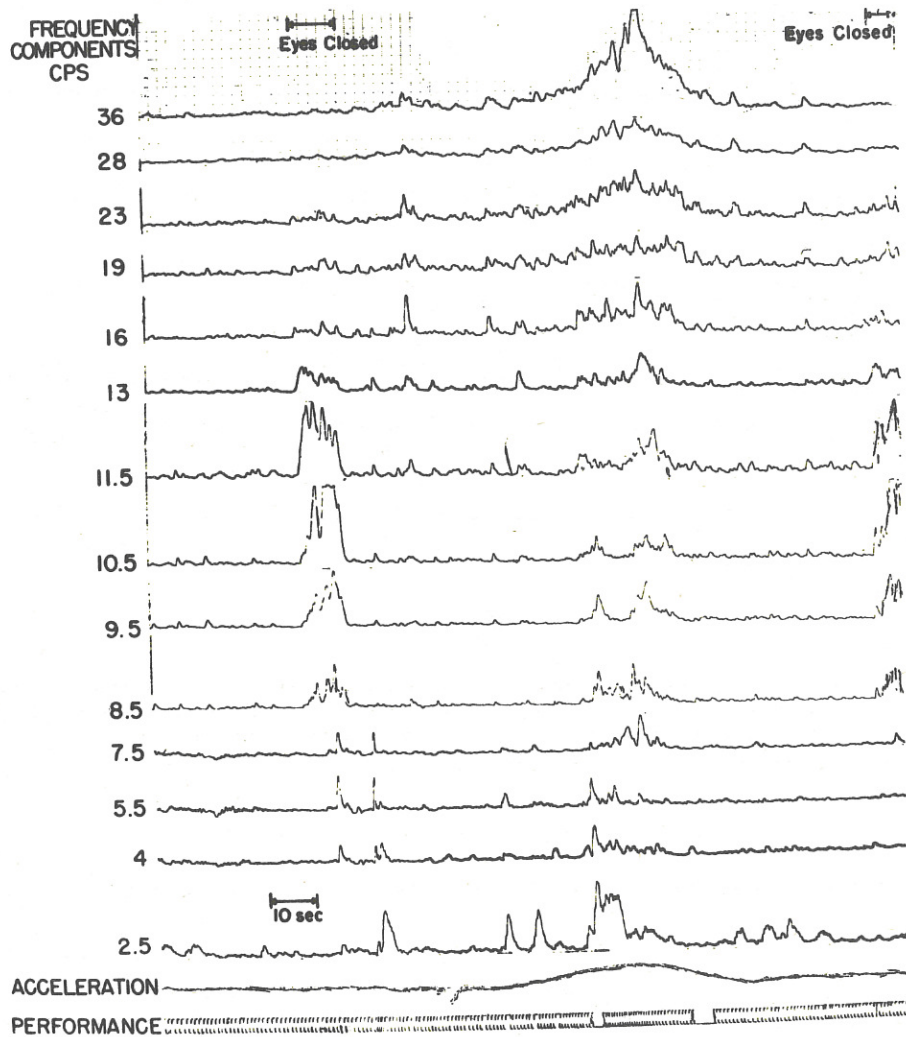


Figure 2

Multiple filter EEG frequency analysis showing changes occurring during positive acceleration.

given in Table II. This table shows that among the three blackout groups the high frequency activity was different, i. e., the poor subjects often had the highest initial beta frequency levels and the appearance of alpha during blackout was low in amplitude. The best index of the level of consciousness appears to be the inverse relationship between the depth of blackout and the amplitude of EEG frequencies in the range of 5 cycles per second. This frequency band will be shown later to be related in the same way to performance level. The lower delta frequencies (≤ 5.5 cps.) were not used since artifacts due to electrode displacement resulting from head movement were most frequently seen

"OFFICIAL PHOTOGRAPH U. S. NAVY"

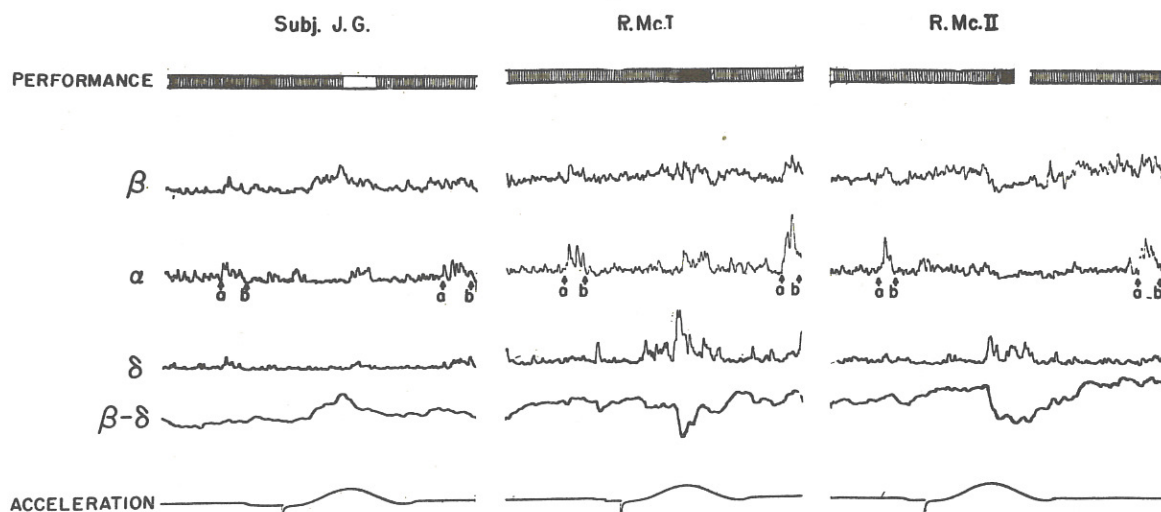


Figure 3

EEG effect of positive acceleration. Subject J.G. experienced greyout during the blank period in the performance task. Subject R.Mc.I experienced blackout during the black period in the performance task. Subject R.Mc.II experienced blackout during the black period and unconsciousness during the blank period in the performance task.

TABLE II

AVERAGE RESPONSES TO ACCELERATION OF 5 SUBJECT GROUPS¹

	No. of Subjects	No. of Runs	Grayout ³ Onset Time (sec)	Blackout Onset Time (sec)	Duration of Blackout (sec)	Duration of No Responses (sec)	Mean Performance Response Time (Control = 0.52 sec)
Group I	7	11	26	29	6	-	-
Group II	6	13	20	24	18	-	-
Group III	4	6	23	25	6	21	-
Group IV ²	3	5	21	26	15	-	0.56
Group V ²	7	10	24	27	9	-	0.69

¹ Classed according to each run. Subjects can appear in more than one group.

² Grayout and blackout information was obtained from subjects during their non-performance task runs.

³ Peak G attained 30 seconds from start.

"OFFICIAL PHOTOGRAPH U. S. NAVY"

"OFFICIAL PHOTOGRAPH U. S. NAVY"

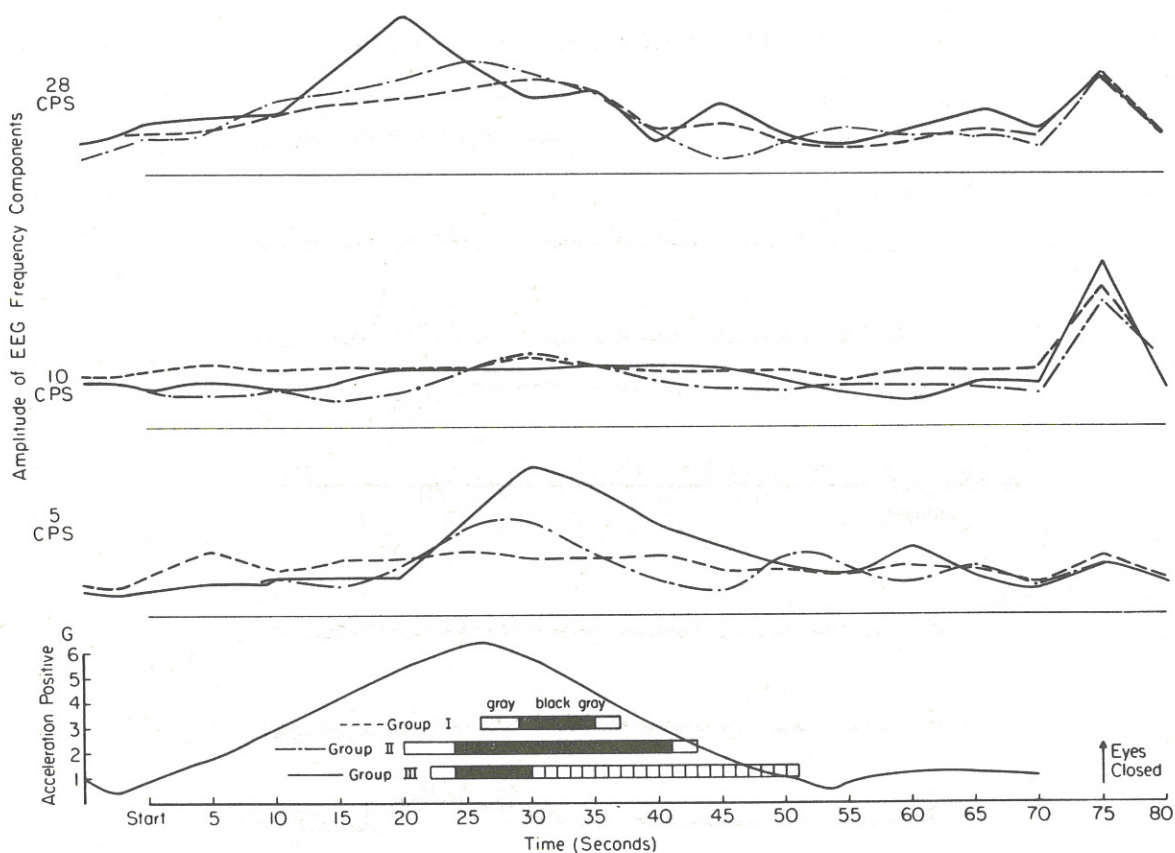


Figure 4

The description for Figure 4 can be found under subtitle "EEG During Blackout".

in this range of frequencies. Moreover, the 5 to 7 frequency band is frequently seen in cerebral hypoxia (Figure 5) which occurs during positive acceleration.

The increase in the low frequencies may however disappear along with the disappearance of all frequencies when loss of consciousness occurs so its value as a monitoring criterion lies in the detection of situations leading to unconsciousness or greatly reduced consciousness levels rather than the occurrence of unconsciousness.

EEG and Performance

Relating EEG with blackout per se represents an indirect correlation with the level of consciousness since it is most probably an indication of the head level blood perfusion pressure common to the eyes and brain. Consequently, a correlation of the EEG with the performance of the subject during acceleration

"OFFICIAL PHOTOGRAPH U. S. NAVY"

EEG 27,000 FT. EFFECTS OF HYPOXIA

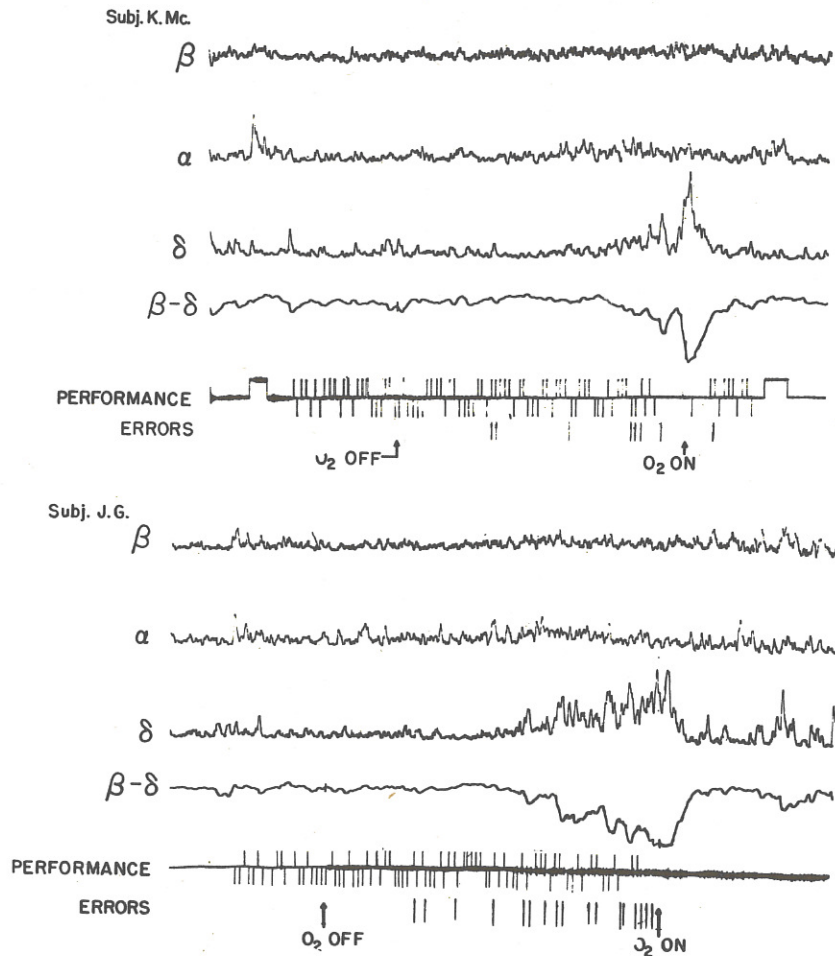


Figure 5

The performance task is the same as for Groups IV and V during centrifuge runs. Hypoxia results in increase in delta activity without apparent change in the alpha or beta activity.

independent of his visual condition was desirable. Subjects unable to respond during deep visual blackout and unconsciousness have already been discussed (Group 3). In order to study less severe impairment of performance, all subjects were subjected to two additional accelerations. They were instructed to respond by depressing the finger switch once if the sum was odd or twice if the sum was even to pair off numbers given by voice every five seconds. The time between the maximum audio signal corresponding to the second number and the response of the finger switch was taken as the response time. If an error was made the response time was scored as one second. However, these errors were rare. Approximately two-thirds of the subjects showed a marked increase in response time during accelerations from the 0.5 second control

level to over one second during acceleration. The other third of the subjects responded with essentially no increase in response time during acceleration even though in prolonged blackout. This group is characterized in Table III as Group IV and the poorly performing group is Group V. The time course of their EEG and performance pattern is shown in Figure 6.

Several major points of comparison arise from these two groups. In the first place the good performers had on the average longer blackout times and lower G thresholds for blackout than did the poor performers. This may possibly be explained by the second point. The good performers were all operational Navy pilots with little centrifuge experience while the poor performers were largely laboratory personnel with considerable centrifuge experience but with little experience with performance tasks. Thirdly, the good-performing subjects (Group IV) showed less of an increase in the 5 and 10 cycle per second frequencies than did the poor-performing subjects (Group V) and also less than the short-blackout subjects (Group I). It would, therefore, appear that a closer relationship exists between the appearance of the slower frequencies and performance than between the slower frequencies and blackout. The EEG response of the poor performers fell between that of the first and second groups as would be predicted on the basis of their blackout duration.

The poor performers could be subdivided further on the basis of the pattern of their prolonged response time. Half of this group made errors at

TABLE III

AVERAGE CHANGE IN THE AMPLITUDES OF 3 EEG FREQUENCIES IN
SUBJECT GROUPS DURING ACCELERATION.

	Duration of Blackout (sec)	Mean Performance Response Time (Control = 0.52 sec)	Percent Increase in EEG Amplitude at		
			5 cps	10 cps	28 cps
Group I	6	-	27	9	17
Group II	18	-	67	18	42
Group III	27 ¹	-	170	33	54
Group IV	15 ²	0.56	20	3	36
Group V	9 ²	0.69	36	12	27

¹ No response or unconsciousness included as blackout.

² Grayout and blackout information was obtained from subjects during non-performance task runs and from verbal reports during performance runs.

the start and end of the run while performing well during blackout while the other half showed their worst performance at peak acceleration.

"OFFICIAL PHOTOGRAPH U. S. NAVY"

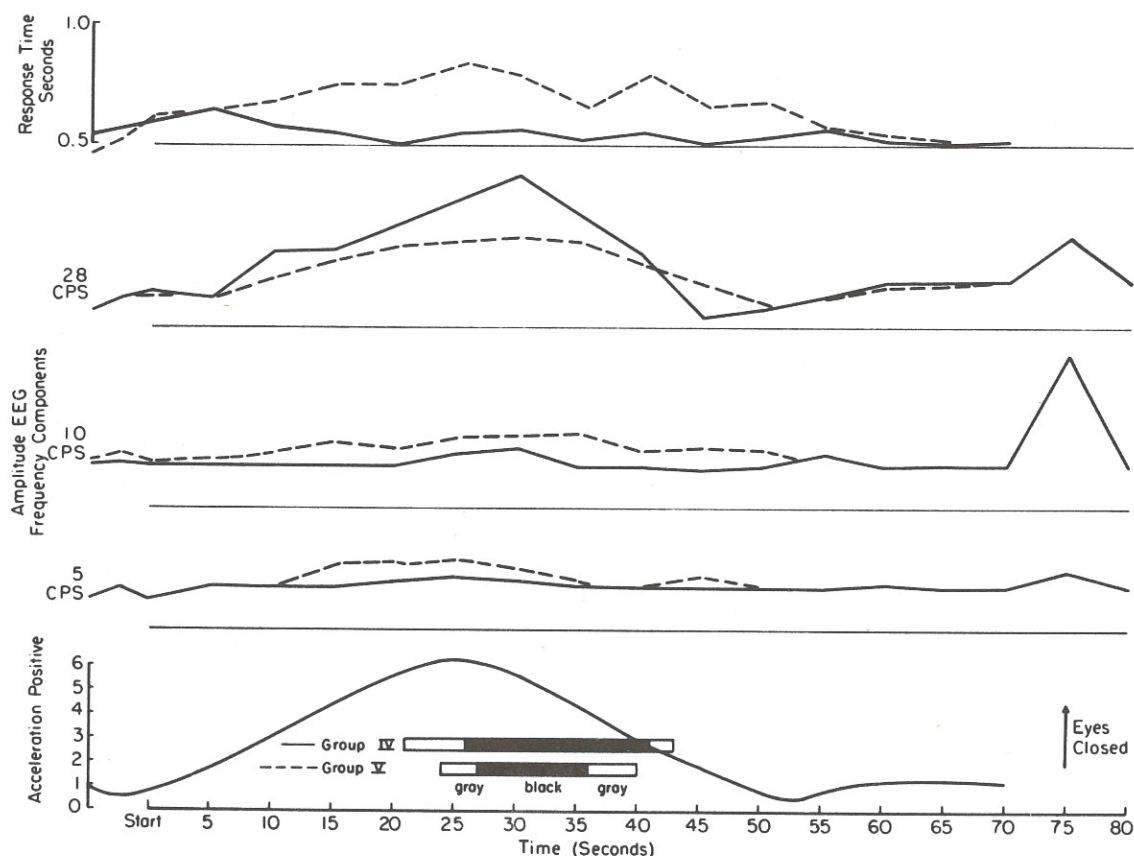


Figure 6

The description for Figure 6 can be found under subtitle "EEG During Blackout".

Discussion

There was a large amount of variability demonstrated on the EEG patterns of subjects subjected to positive acceleration. Consequently, attempts to demonstrate significant statistical differences between mean frequency amplitudes in the control and acceleration periods never exceeded the 0.1% level. Such a statistical analysis, even when not showing high probabilities, does however show a trend in the type of EEG patterns which may be associated with gray-out and blackout conditions and the ability to perform a mental activity task. This trend may be emphasized by further refinement of technique and by further study of the factors involved.

For real time monitoring purposes it is necessary to know not the probability of the mean of a population but the probability of a single individual

falling into a particular group. This probability decreases depending on how finely the medical monitor wants to classify the condition of the subject and increases if all that is wanted is an indication of incipient loss of consciousness. In the case of the groups analyzed such probability is 3 or 5 to 1 that a subject showing a certain EEG pattern will fall into a low or high blackout threshold group while the probability may be as high as 10 to 1 that loss of consciousness can be predicted from his EEG pattern.

These studies clearly show that the satisfactory recording of the micro-volt level EEG signals can be accomplished using miniaturized equipment on subjects undergoing high environmental stresses with little inconvenience to the subject. The use of a single channel has been found to give useful information with a minimum of equipment, while the use of standard band pass filters at three control frequencies has allowed the real time low speed recording, 1 mm. per second, of the single channel EEG data with sufficient information content to determine with a fair probability the level of consciousness of the monitored subject.

References:

1. Sem-Jacobsen, C. W., Nilseng, O., Patten, C., and Eriksen, O.: Electroencephalographic Recording in Simulated Combat Flight in a Jet Fighter Plane. *EEG Clin. Neurophysiol.*, 1959, 11, 154.
2. Gastaut, H., Lee, M. C., and Laboureur, P.: Comparative EEG and Psychometric Data for 825 French Naval Pilots and 511 Control Subjects of the Same Age. *Aerospace Med.*, 1960, 31, 547.
3. Riehl, J. L.: Analog Analysis of EEG Activity. *Aerospace Med.* 1961, 32, 1101.
4. Adey, W. R., French, J. D., Kado, R. T., Linsley, D. F., Walter, D. O., Wedt, R., and Winters, W. D.: EEG Records from Cortical and Deep Brain Structures During Centrifugal and Vibrational Accelerations in Cats and Monkeys. *IRE Trans. on Medical Electronics*, 1961, BME-8, 182.
5. Ades, H. W.: Electroencephalographic Finding in Relation to Episodes of Altered Consciousness in Aviators. *Aerospace Med.*, 1962, 33, 263.
6. Rubin, M. A. and Freeman, H.: Brain Potential Changes in Man during Cyclopropane Anesthesia. *J. Neurophysiol.* 1940, 3, 33.
7. Kiersey, D. K., Bickford, R. G., and Faulconer, A., Jr.: Electroencephalographic Patterns produced by Thiopentol Sodium during Surgical Operations. *Brit. J. of Anesth.*, 1951, 23, 141.
8. Faulconer, A.: Correlation of Concentration of Ether in Arterial Blood with Electroencephalographic Patterns Occurring during Ether-Oxygen, and during Nitrous Oxide, Oxygen, and Ether Anesthesia of Human Surgical Patients. *Anesthesiology*, 1952, 13, 361.
9. Blake, H., Gerard, R. W., and Kleitman, N.: Factors Influencing Brain Potentials during Sleep. *J. Neurophysiol.* 1939, 2, 48.
10. Adrian, E. D., and Yamagiva, K.: The Origin of the Berger Rhythm. *Brain*. 1935, 58, 323.

11. Galla, F. L., Hutton, E. L., and Grey, W. W.: Objective Study of Mental Imagery; Physiological Concomitants. Appendix on New Method of Electroencephalographic Analysis. J. Ment. Sc. 1943, 89, 216.
12. Gordon, J., Jensen, R., Sipple, W., and Squires, R.: NADC Biological Instrumentation Symposium of 10 Dec. 1958; fifth letter report concerning. U. S. Naval Air Development Center, Aviation Medical Acceleration Laboratory, Johnsville, Pa. Letter report No. NADC-MA-L6012 of 3 May 1960 (Serial No. 3247).

* * * * *

RESERVE



SECTION

Promotion Policy Outlined for Reserve Officers
(concluded)

The temporary appointment is mailed to the qualified selectee via the command that maintains his record. The Reservist must execute the acceptance before he is eligible to assume the title of the next higher grade.

Failure to Qualify

The name and record of an officer who fails to establish his professional qualifications within the time prescribed are submitted to the selection board constituted as an examining board the following fiscal year. A determination is then made as to whether the officer should be retained on the promotion list. If he is retained by the examining board, he will be given additional time in which to complete his professional qualifications. If he is not retained, he is considered by law as having twice failed of selection and must again stand selection.

SecNav regulations provide that officers who have completed their professional qualifications but fail to qualify physically and accept their appointment within six months following the date on which they qualify professionally may have their name placed before the Naval Reserve Officers Mobilization Disposition Board. All officers in this category are currently being referred to this Board which may recommend discharge, transfer to the Inactive Status List (ISL) for lack of interest, or retention in an active status.

Ensigns who are appointed lieutenants (junior grade) upon completion of the required service must qualify and accept appointment within one year from the date of their appointment. Ensigns who fail to qualify must also face Disposition Board action.

Transfer to the ISL

What effect does transfer to the Inactive Status List have upon an officer? First, and most important, he is no longer able to take part in Reserve training except by enrolling in correspondence courses. While on the ISL he may earn promotion points through correspondence courses, but he cannot earn retirement points.

Second, under present law, officers cannot be considered by a selection board until one year following the date of removal from the ISL. For example, consider a lieutenant commander who has been on the ISL and who is removed from the list on 1 Apr 1963. By 30 Jun 1963, he may have earned the required points and be otherwise eligible for consideration for promotion. But—because the selection board meets in January 1964—his name and record cannot be presented to the Fiscal Year 1964 board. He cannot be considered for promotion until the following year. This provision does not constitute "failure of selection," however.

As a third effect, transfer to the ISL of an officer on the promotion list terminates his selection—regardless of the reason for transfer to the ISL. This action is required by law.

Promotion After Retirement

The law now provides for the promotion of Naval Reserve officers who are on a promotion list and who, before accepting their promotion, are transferred to the Retired Reserve (or discharged, as required by law). This action must result from physical disability, completion of authorized service, or the attaining of the mandatory retirement age.

Therefore, a Reserve commander selected for promotion to captain who, before he can effect his appointment, reaches the mandatory retirement age, will be retired in the grade of captain. Of course, no additional pay or allowances will accrue because of this promotion.

This business of selecting officers for promotion is a complicated procedure. Each year, the Navy spends considerable time and money trying to make sure that all eligible persons are treated in as fair and impartial a manner as is physically possible. Efforts are double checked to insure that the records of all eligible candidates are considered by the designated board.

The foregoing general discussion should answer many of your questions concerning promotion under the Reserve Officers Personnel Act of 1954, (ROPA), as amended. However, because of the complexity of the program and space limitations, it is impossible to cover every contingency in a general article.

Additional information may be found in BuPers Instructions 1412.1E, 1416.4D, and 1570.4.

The Naval Reservist
NAVPERS 15653, December 1962

Policy Changes on Transfer of Naval
Reserve Officers to or from Inactive Status

Title 10, U.S. Code, requires the removal from an active status of all unobligated Reserve officers who fail to comply with minimum standards of participation prescribed by the Secretary concerned. Navy Department directives implemented this provision of law, but due to administrative limitations provided for removal from active status only those officers entering or in a promotion zone. Article H-3705, Bureau of Naval Personnel Manual, prescribes that all officers, with certain exceptions, will be removed from active status without regard to promotional zones. Because of numerical ceilings which limit the number of Naval Reserve officers authorized in an active status, it is necessary to screen officers most carefully to insure that only those who maintain a reasonable degree of proficiency by active duty and/or active participation in the Naval Reserve Training Program are retained or allowed to transfer to an active status. Commencing in December 1962, all officers who failed to earn 12 retirement points (exclusive of gratuitous points) in their anniversary year ending in fiscal year 1962 or any fiscal year thereafter, will be removed from active status effective 31 December following the end of the applicable fiscal year.

* * * * *

POSTAGE AND FEES PAID
NAVY DEPARTMENT

DEPARTMENT OF THE NAVY
U. S. NAVAL MEDICAL SCHOOL
NATIONAL NAVAL MEDICAL CENTER
BETHESDA 14, MARYLAND

OFFICIAL BUSINESS

Permit No. 1048